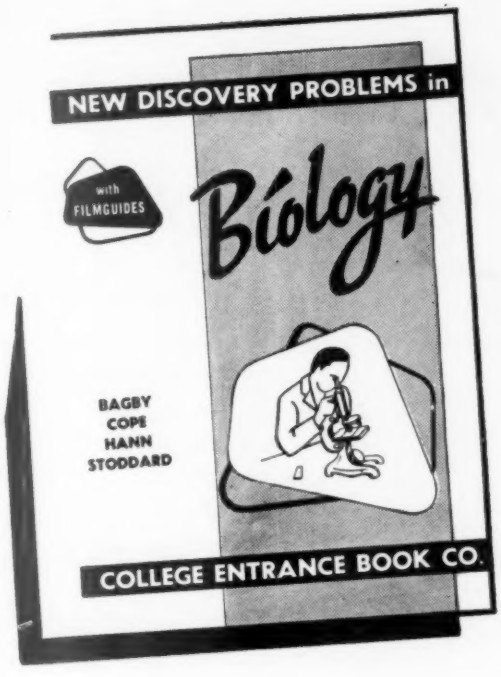
The American Biology Teacher

A service publication of
The National Association of Biology Teachers
teaching the life sciences from elementary grades through college

MARCH, 1953 **Vol. 15, No. 3**

Conservation Camp . . .
. . . Ecology in Conservation



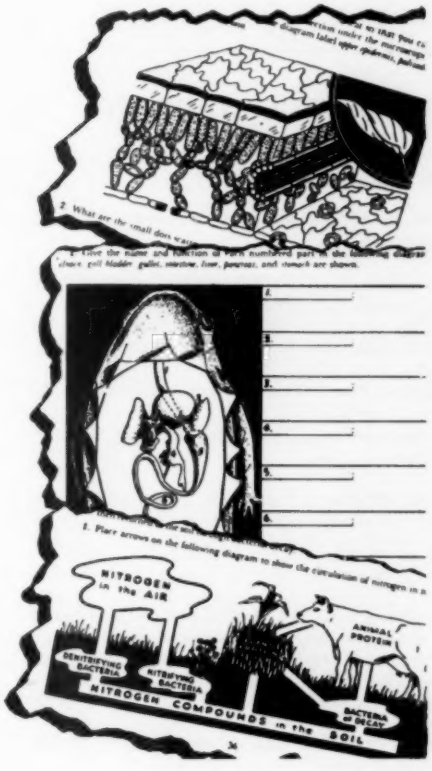
New
DISCOVERY PROBLEMS in BIOLOGY

A STUDY GUIDE FOR USE WITH ANY TEXT

The Only Biology Workbook That Gives You —

STANDARDIZED TESTS . . . with tables of norms (based on thousands of actual scores in classrooms all over the country) . . . to help you measure each student's performance.

FILMGUIDE LESSON SHEETS . . . Booklets of worksheets for each student to use in conjunction with the biology films you show.



New Discovery Problems in Biology

is your complete teaching program—reading assignments in all the current texts . . . lesson plans for each topic . . . optional work . . . vocabulary drills . . . periodic reviews and tests. It's so easy to use . . .

. . . And students, too, enjoy learning from this stimulating study guide. They like especially the abundance of instructive diagrams, the variety of activities, the feeling of accomplishment which each completed page gives.

Write for your free examination copy before selecting next year's materials.

COLLEGE ENTRANCE BOOK COMPANY
104 Fifth Avenue, New York 11, N. Y.

THE AMERICAN BIOLOGY TEACHER

Publication of the National Association of Biology Teachers.

Issued monthly during the school year from October to May. Entered as second class matter October 26, 1939, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

Publication Office—111 E. Chestnut St., Lancaster, Pa.

Editor-in-Chief—JOHN BREUKELMAN, State Teachers College, Emporia, Kan.

Assistant Editor-in-Chief — B. BERNARR VANCE, Daniel Kiser High School, Dayton 4, Ohio.

Managing Editor—MURIEL BEUSCHLEIN, 6431 S. Richmond, Chicago 29, Ill.

Subscriptions, renewals, and notices of change of address should be sent to the Secretary-Treasurer, John P. Harrold, 110 E. Hines Ave., Midland, Mich. Correspondence concerning advertising should be sent to the Managing Editor.

The entire Staff List will be found in the March and November issues.

Annual membership, including subscription, $2.50, outside United States, $3.00.

TABLE OF CONTENTS

THE COVER PICTURE

THE COVER PICTURE was taken by Dr. Dorothy Miller Matala, of the Department of Science, State Teachers College, Cedar Falls, Iowa. It was taken with a Kodak Medalist II, on Plus X film, 1/100 second at F11 without a filter. The students were testing water from a farm pond near Menlo, in Guthrie County, Iowa.

The American Biology Teacher

Vol. 15 MARCH, 1953 No. 3

The Iowa Teachers Conservation Camp

H. SEYMOUR FOWLER AND DOROTHY M. MATALA,
Iowa State Teachers College, Cedar Falls, Iowa

Again this year at the Iowa Teachers Conservation Camp, experiences in Conservation will be available to Biology teachers. As in the past, emphasis will be placed on field experience with the various resources under consideration. Specialists from many federal, state, and local organizations help to give the training authority. Emphasis in the Secondary Session of the Camp is placed on conservation of soils, water, forests, and wildlife. Of course, the interrelationships existing between and among these resources are stressed. With field experiences as the background, the teachers will be given an opportunity to view and construct many teaching aids for use later in their classrooms. Individual research is encouraged to the extent that each teacher undertakes an observational study during the three-week period at the Camp. In the past, many interesting things have been observed and "discovered" for the first time, at least by the investigator.

Rocks and minerals, glaciation, soil types, soil properties, and soil associations make up a portion of the study of soils as a resource. A trip to a farm managed according to U. S. Soil Conservation Service specifications and recommendations sums up the week. Aquatic habitats with emphasis both on life in these habitats and the physico-chemical factors influencing life in these habitats are the topics encountered in the field work on water as a resource. The cover photograph shows two students investigating the physico-chemical factors in a farm pond—in this case the Winkler test for dissolved oxygen. In discussion and in many cases through actual observation, water and its use for power, transportation, and recreation are subjects included to supplement and augment the field work in this phase of the Camp experience.

Timber resources and their management in Iowa are not of major importance when compared to the soil resources of the state. Consequently less actual class time is used in studying this phase of conservation. Classes do have experience in learning to identify trees and in techniques used in the study of and management of small woodlots. As windbreaks are an important use of trees in Iowa, these are studied in some detail during the period of the Camp devoted to forests as a resource.

Since wildlife habitat is dependent on the proper management of water, soils, and forests, the discussion of wildlife as a resource is interwoven into the experiences with the three resources mentioned. Also the teachers are given specific information through field experience and discussion which covers: wildlife

typical of forested areas and forest borders, examples of cover requirements, succession, hunting and fishing regulations, signs of animal activity, fur bearers, predators, and their control.

This is only a brief description of a portion of the total experience at Camp. We believe that as a result of the Camp experience, teachers gain a greater knowledge of and appreciation for the values of their natural resources. These are a necessary prerequisite to the development of a sound attitude toward wise utilization of the resources. With the Camp experience as a background, these teachers are better able then to take the Conservation Story to the youth of our nation.

With the assistance of a Soil Conservation Service representative, students examine a road cut.

The Open Road to Education for Family Living

ARTHUR J. BAKER, Instructor of Biology and Family Living,
Crystal Lake Community High School, Crystal Lake, Illinois

So you really believe in Education for Family Living? You have surveyed the parents and found them cooperative. The teachers, too, have given their blessing. Surveys of the pupils show a genuine eagerness. You have received the approval of the ministry on the probable content of the course. The administration and Board of Education are solidly behind you. What comes next?

Whom might you expect to enroll? It might be interesting to note the profile of our first class. Out of the 29 participants, well over half were interested primarily in athletics, athletic clubs, hunting, fishing, and the like. We have, then, a predominantly wholesome type of youth interested. Twenty-four of the 29 went to college, so the above-average pupil was interested. Age, too, seemed to be a factor, for their average age was well above the average age for seniors generally.

What shall we teach them? Your writer was most fortunate in having been chosen to work on an Illinois state-wide committee under the able leadership of Professor C. O. Jackson.[1] The task of this committee was to write a course of study for Family Living.[2] Below are listed the parts of this study that we have used at Crystal Lake:

1. Boy-Girl Relationships. This unit approaches the problems of personality, character-making, keeping friends, dating, going steady, petting, adolescent growth, and development.
2. Preparation for Marriage. We start here with a brief history of the family, followed by the function of the family, role-finding in the family, selection of a mate, the engagement period, and the marriage laws of our state.
3. Adjustment in Marriage. We study the many modern social pressures on the family, the basic needs of marriage partners, common sources of conflict, and family crises. Our goal is to better learn how we can adjust to these problems.
4. Pre-Natal Development and Infant Care. This title seems self-explanatory.
5. Child Development. The characteristic needs of childhood are investigated, along

[1] Professor C. O. Jackson, Ed.D., is Editor of "The Physics Educator."

[2] This unit, "Suggested Outline of a Unit for Family Living and Human Relations," may be secured through Mrs. Hazel O'Neil, Health Coordinator, State Department of Public Instruction, Springfield, Illinois.

with the actual observation of young children. Studies are made concerning the types of play materials best suited to various ages. The emotional problems of love, fear, anger, and jealousy, along with the guidance principles for their most efficient control, are studied.

6. Understanding and Training Children. On the thesis that attitudes and emotions formed early in life greatly affect our later adjustment, we study the mental and emotional aspects of child development.

How shall we teach Family Living? The democratic approach to the teaching of Family Living is thought by many to be so important that it actually becomes a part of the subject matter, and I am inclined to agree. The pupil who is making an honest effort to fit into a democratic classroom situation will find, shortly, that he has more friends, has learned to "give a little" so that the group can progress toward a goal, has learned to be of assistance to others, has learned to think as a member of a group rather than by and for himself, and has learned to compromise when his ideas conflict with those of the majority. In short, he is a better person, and is in a much better frame of mind to make marriage a success even before consideration of all the things he will learn about making that marriage a success.

We approach a unit along the following pattern: The entire class, through informal class discussion, attempts to define the problems of specific interest and value that are found within the unit under discussion. Interest groups are then formed, and these committees set about to draw sensible conclusions for their problem. These conclusions are reported to the class as a whole for further discussion and modifications. This latter phase is enriched by community resources, role-playing when appropriate, and wide reading from resource books.

In the meantime, other interest groups work out interesting and authentic "Case Situations," which are now brought in and solved by the class. This last step aids the group in formulating sociably acceptable solutions to the various problems found within the unit.

As an example, let us assume that our unit is "The Engagement Period." The class will define problems found within this unit, such as the problem of "Finance," the problem of "Religion," etc. These problems are the basis for the formation of committees, which attempt to organize a solution by wide reading and discussion. A resource aid in this unit might be an engaged couple. Role-playing aids the student in projecting himself into the role of an actually engaged person and, therefore, feel the problem more personally. A discussion of case situations aids the group in further crystallizing their thinking into acceptable solutions of the problems within the unit.

The problems within a unit, such as used in the example above, are easily grasped by the adolescent mind, but other units are more difficult in this respect. It is then that the class may be forced to draw upon parents, other teachers, friends, or a professional crutch such as the Mooney Problem Check List,[3] to assist them in this task.

The use of community resources. During the first week of the semester, we appoint a committee from the class to make a study of the ways in which the class can use community resources. Just a few of the activities planned by these committees and which proved most successful are listed below:

1. A Visit to the Elgin Asylum. At the conclusion of this trip a psychologist explains the effect of an unhappy family life upon some cases of insanity.
2. A Week-End Work Camp in the Chicago Slums. Sponsored by the American Friends Service Committee.[4] This experience has been most stimulating in the area of Human Relations. The broad understanding of the differences between peoples of various races and various economic strata is a real aid to future marriage problems. The young folks have, on the

[3] "Problem Check List for High School," by Ross L. Mooney, obtainable through the Bureau of Educational Research, Ohio State University, Columbus, Ohio.

[4] For information, write to: Week-end Work Camp, American Friends Service Committee, 19 South LaSalle Street, Chicago 3, Illinois.

week-end, the opportunity of working in a slum home, patching rat holes, papering, painting, putting in broken windows, etc.

3. Parent Visitation. They come in to talk with us concerning problems in dating, use of the family car, what time to get in at night, and many other pertinent subjects of great interest to both parents and adolescents.
4. Visits to Divorce Courts. The local judge has come to us to discuss the problems of divorce.
5. Young Married Couples. Some of them are "expecting," and have come to discuss with us the problems of adjustment in early marriage, and the impact of the child on the home.
6. Motion Pictures. The committee, working with the instructor, assisted in the choice of motion pictures to be shown to the class, and often sat in on the preview to help in the task of showing what in the film is of basic importance.

Resource material. You have surmised before now that the class in question is not being taught in an orthodox manner by assignments from a textbook. Rather, we have several copies of many texts, plus several copies each of many pamphlets, which are used as resource material when the various committees need assistance from technical resources. These are listed at the end of this article. I am pleased to report that this method has resulted in much more prolific reading than would have been the case had I been giving specific assignments.[5]

Evaluation. I read recently that a course in Marriage Problems has been offered at Stephens College, Columbia, Missouri since 1934. A recent survey of the graduates of this college, who had taken the course in Marriage Problems, showed 28 divorces in 1,064 marriages. Notice how favorable these statistics compare with our national average.

We hope some day to have a valid evaluation of our efforts. It can only be made some time in the future, when I may be privileged to go into the homes of these present youngsters and judge, first-hand, the results of our labor.

[5] Maturity is a factor in this manner of using resource material as the class is an elective, coeducational group.

References

Aids to democratic classroom procedure. Buzz Session, Role-playing, Panel Discussion, Dramatization and Informal Class Discussion.

Chase, *Roads to Agreement*. Harper, New York. 1951.

Strauss, Bert and Frances, *New Ways to Better Meetings*. Viking Press, New York. 1951.

Walsh, Letitia, *Some Rewarding Procedures in Education for Family Living*. University of Illinois.

Two Lessons in Group Dynamics. Educators' Washington Dispatch, Washington, D. C.

Group Processes in Supervision and Curriculum Development. NEA Association for Supervision, 1201 16th St., N.W., Washington 6, D. C.

A Team of Teaching Techniques. Bulletin of the State Teachers College, Minot, North Dakota.

Biester, Griffiths and Pearce, *Units in Personal Health and Human Relations*. Minneapolis, Minn., University of Minnesota. 1947.

Bowman, Henry A., *Marriage for Moderns*. McGraw-Hill Book Co., New York. 1942. 493 p.

Bullis, O'Mally, *Human Relations in the Classroom, Course I and II*. Wilmington 19, Delaware, The Delaware State Society for Mental Hygiene.

Duvall and Hill, *When You Marry*. D. C. Heath and Co., New York. 1945.

Experimental Resource Units for Teaching Family Relationships in Junior and Senior High Schools, Illinois Bulletin 95, Series A.

Foster, Robert G., *Marriage and Family Relationships*. The Macmillan Co., New York. 1944.

Hogue, Hellen Gibson, *Understanding Ourselves*. C. Scribner's Sons, New York. 1947. 162 p.

Shacter, Helen, *Understanding Ourselves*. McKnight and McKnight, Bloomington, Illinois. 1949.

Shacter, Helen, *How Personalities Grow*. McKnight and McKnight, Bloomington, Illinois. 1949.

Sorenson, Herbert, and Marguerite Malm, *Psychology for Living*. McGraw-Hill Book Co., New York. 1948. 630 p.

Strain, Frances B., *Love at the Threshold*. D. Appleton-Century Co., Boston. 1939. 349 p.

Bertocci, Peter A., *The Human Venture in Sex,*

Love, and Marriage. Haddam House, Association Press, New York. 1950.

DUVALL, EVELYN MILLIS, *Keeping Up With 'Teen-Agers.* Public Affairs Committee.

MOFFETT, M'LEDGE, *Youth Looks at Marriage.* Association Press, New York. 1949.

KIRKENDALL, LESTER A., *Understanding Sex.* Science Research Associates, Inc. 1949.

We Grow Up. State of Illinois Department of Public Health. 1950.

KIRKENDALL, L. A., AND RUTH FARNHAM OSBORNE, *Dating Days.* Science Research Associates, Inc. 1949.

RADIO TRANSCRIPTIONS

The Endless Frontier. A series of 5 half hour Radio Transcriptions. 16 inch 33 1/3 R.P.M., free loan from Health Information Foundation, 420 Lexington Avenue, New York 17, New York. Raymond Massey commentator.

1. The Search—for a cure for cancer continues, but total success eludes the searchers.
2. The Trouble Shooters—the story of cortisone with first hand accounts from patients and workers.
3. Our Daily Bread—are Americans overfed but malnourished? Yes! Vitamin B_{12} and its relation to anemia and feeding of liver are discussed.
4. Only One to a Customer—but how well can you get along with an ailing heart and how long will you live?
5. Man Alive—because you gave a pint of blood. Blood banks offer you an opportunity to make the most important contribution possible to Americans on the battlefields.

Hear the voices of some outstanding medical researchers of the world as they tell you of their own part in dramatic events which have extended the life span for thousands of persons who are no longer living on borrowed time. The booklet which summarizes the stories told by these recordings is available in quantities.

All Their Powers, 1951. A series of 5 half hour Radio Transcriptions. 16 inch 33 1/3 R.P.M., free loan from Health Information Foundation, 420 Lexington Avenue, New York 17, New York. Ben Grauer commentator.

1. They Bid for Health—a community works together to build a hospital in Alexander County, North Carolina.
2. Good Health, Good Box Office—citizen sponsored health tests given to all residents in Atlanta, Georgia, to detect certain diseases.
3. Health Comes Calling—health problems in Clinton County, Ohio, solved through community participation.
4. Hospitals Join Hands—four hospitals in Minneapolis share in a centralized plan to keep costs down.
5. What the Doctors Ordered—citizens of Alameda County, California, establish a public information service about available local medical services.

First hand accounts from participating citizens which lead to the solution of their community's health problems add a realistic touch to the transcriptions.

An adequate answer to socialized medicine and compulsory government sponsored high cost health insurance.

Audio-Visual Aids Committee

We had to omit *Biology in the News* this month, but it will be a regular feature of ABT in the future.

Coming Soon—Phase-Contrast Method of Microscopy, A Method of Controlling Euglena, Anxiety and Fear of Animals, Air Fern, Aligning Plate for Opaque Projector, Inspiration Via the Disc.

Manuscripts intended for the October issue must be in the editor's hands before June.

Growing Fern Prothallia

Every teacher of biology appreciates the advantages of living material for teaching purposes in the laboratory. But not every teacher realizes how much such material can be made available with a little forethought, time and care.

Methods for growing fern prothallia on soil, on the outside of clay flower pots, or on agar are described in many texts and scientific articles.

An abundance of material was secured in our laboratory this year from spores of *Pteris longifolia.* This fern is often used as a filler with potted poinsettias at Christmas time. It is very hardy, withstands well adverse conditions found in the laboratory and with a little care produces a decorative plant with a ready supply of spores.

That the spores are not demanding in their requirements is indicated by the results obtained when spores were sprinkled on agar originally prepared for use in growing moss protonemata. The formula was supplied by Johansen:

Distilled water	1	liter
Ammonium nitrate	1.0	gram
Potassium sulphate	0.5	gram
Magnesium sulphate	0.5	gram
Calcium sulphate	0.5	gram
Ammonium phosphate	0.5	gram
Ferric sulphate	0.01	gram
10% aqueous potassium hydroxide	a few drops	[1]

This was solidified with 0.75% agar and the Petri dishes kept in a Wardian case to conserve moisture. A few drops of distilled water were added to the dishes as needed. Prothallia were readily transplanted from one dish to another.

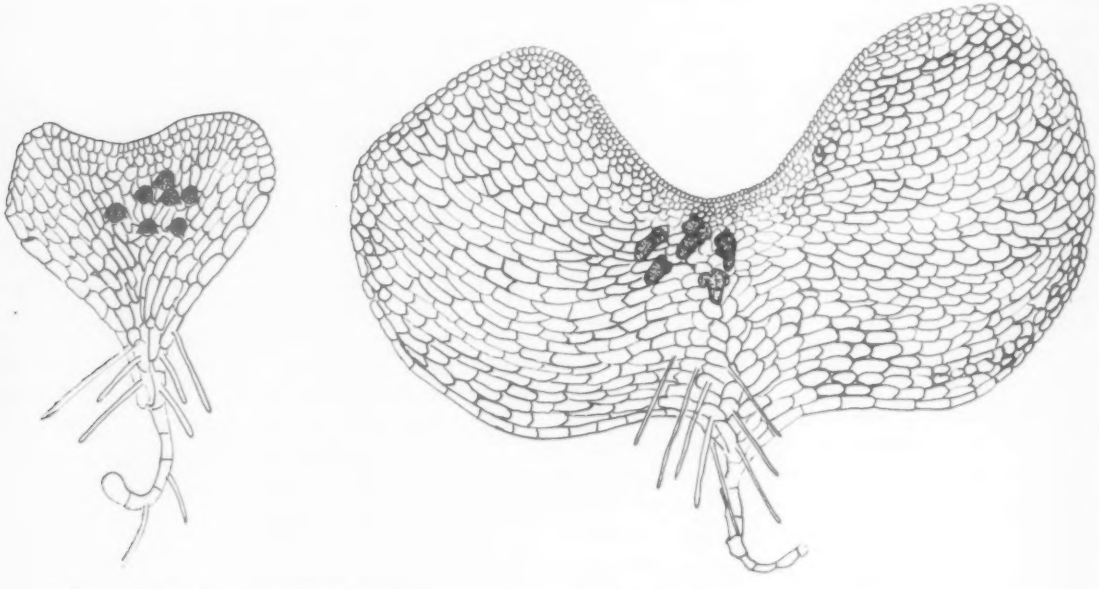
[1] Johansen, Donald A., Plant Microtechnique, McGraw-Hill Book Co., N. Y. 523 pp. Illus. 1940.

In a few weeks, the first antheridia began to appear; about two weeks later, archegonia were present. A few more weeks passed before the appearance of developing sporophytes. For many months, excellent material in all stages of development was available from a single sowing of spores.

SISTER MARIA LAURENCE,
Marywood College,
Scranton, Pennsylvania

REWARD!

Managing Editor Bueschlein offers a free 1953 or renewal NABT membership to that teacher or student who submits the most suitable name or heading for the Classified Advertising column. Send all entries directly to the Managing Editor.



Fern prothallia, magnified 40 diameters with antheridia (left) and with archegonia (right).

The Cooperative Committee of the American Association for the Advancement of Science

The 1952 annual meeting in St. Louis marked the sixth anniversary of NABT's membership on the AAAS *Cooperative Committee on the Teaching of Science and Mathematics.*

It is appropriate that a brief review of activities be given now, for it was during the 1946 meeting in St. Louis that NABT was given meritorious recognition and invited to name a representative to the Cooperative Committee by Dr. Otis W. Caldwell, AAAS sponsor and director of the Committee.

Dr. Karl Lark-Horovitz, dynamic and noted physicist of Purdue University, was chairman of the Cooperative Committee at the time NABT joined it. During its early existence the major problems of the Committee centered around the college

training of science teachers, licensing and certification of prospective teachers, and studies of the secondary school science curriculum. Later the Committee made extensive investigations relative to the part played by science in general education. A number of panels and symposia pertaining to the program of science in general education has been presented by the Committee to AAAS and central association audiences. What might be termed the climax of consideration for the problem of science education for the general public, the layman of science, came in 1949 when a series of papers pertaining to chemistry, physics, general science, and biology in general education were given on the program of the Central Association in Indianapolis. Contemporary with the preparation of these papers was the sponsorship by the Committee of a graduate study to ascertain the extent and nature of science courses offered by colleges and universities throughout the nation as a part of the general education program. This study was a doctoral study made by John Bullington of Northwestern University.

The purpose of the Cooperative Committee is to keep abreast of individual and group movements relative to science education problems and to serve as a clearing house or liaison body for related efforts. Because of its front-line position, the Committee has been alert to many kinds of movements some of them minor so far as time and scope are concerned, and, on the other hand has emphasized the major projects of science education. As a result, the major efforts of the Committee have shifted from studies pertaining to science teacher training and certification, to science in general education, and currently, identification and recruitment of youth having special scientific ability. Formerly the Cooperative Committee concerned itself primarily with problems at the secondary level; but when in 1947 John R. Steelman, director of President Truman's Scientific Research Board, called upon it to study the effectiveness of science and mathematics instruction in the United States, and to make recommendations pertaining thereto, it became evident that the scope of the survey must include not only the secondary level, but elementary, college, and even postgraduate levels as well. Since the PSRB project the Committee has contrived to include all educational levels in its considerations.

Impetus was given to the problem of identification and recruitment of scientific potential because of the impending critical shortage of scientific personnel for industry and defense. While the areas of physics, chemistry, and mathematics are particularly spotlighted here, the importance of the biological sciences is recognized in many aspects and it is expedient that biologists should foster this recognition. Medicine, insect control studies and nutritional research are examples of the jobs to be done by biologists.

Further implementation of its program was made possible in 1949 when representatives of the U. S. Office of Education met with the Committee and Bernard B. Watson of the Office of Education became a member of the Committee. A move toward close cooperation came with the resolution that the Cooperative Committee and the U. S. Office of Education should seek to coordinate their efforts by a mutual exchange of information and advice on (1) science in general education at all levels, (2) the early identification of science talent and its encouragement at all levels, (3) the training of science and mathematics teachers and (4) problems of adult education in science and mathematics. Since then, one meeting has been held jointly in Washington to consider these and other problems.

In the meantime, Dr. Lark-Horovitz resigned as chairman of the Committee and Dr. Morris Meister was elected to take his place. In 1948, under the direction of Ralph Lefler, then secretary of the Cooperative Committee, plans were made to coordinate the programs of the teaching societies of AAAS into a joint program for the annual meeting. The American Nature Study Society, The National Asociation of Biology Teachers, The National Science Teachers Association and Section Q (Education) of the AAAS cooperated that year.

Joint programs have been continued. The Cooperative Committee has maintained a representative on the planning committee for the programs; however, responsibility for the coordination has lately been rotated among representatives of the participating societies. For example, NABT chaired the committee last year and will do so this year, then the position will shift to another society. The Cooperative Committee's actual part in the joint program has been to cooperate in the planning and correlate one session of its own into the program.

A somewhat detailed review of last year's activities will serve to bring NABT readers up to date with the program of the Cooperative Committee.

The Cooperative Committee held two meetings in 1952, one at the University of Wisconsin in May, and the other in joint conference with the United States Office of Education in Washington, D. C., in November.

At the May meeting a number of current items pertaining to science and mathematics education were considered. Chief among those for which continuing action was decided were as follows:

1. The Committee's primary concern just now is the development of programs to identify, guide, and assist students gifted with scientific ability. To that end, it was decided (1) to schedule a program session on Sunday afternoon, December 28 during the AAAS annual meeting, and (2) to continue its representation in the joint program of groups sponsoring the second annual conference on Scientific Manpower.
2. The Committee heard Dr. Howe, who has charge of the programming of the students at the University of Wisconsin as participants in the Ford Foundation Scholarship project. These 52 students were selected by a committee of the Ford Foundation from the junior and senior classes of a number of high schools. Other universities receiving students as Ford Foundation scholars last year were Chicago, Columbia, and Yale. A number more are participating in the project this year. It was felt, in view of a considerable question raised by many high school administrators as to the wisdom of the project, that further investigation of the outcome of the experiment at other universities should be made. Dr. Howe reported that in general the students at Wisconsin were able to adjust themselves well to university life. Most of them were at the top of their classes. Further discussions are to be arranged by the Committee and individuals in charge of the program to consider what part the Committee might play in making an evaluation of the program.
3. It had previously been decided to investigate the possibility of preparing some non-commercial guidance material pertaining to science.
4. The Cooperative Committee hopes to bring together, whenever necessary, the factions of education and subject matter, at times when such factions occur. A concrete example of this was made by the Committee's investigation of the articles by Professor Harry J. Fuller and others which gave rise to a controversy between the two schools of thought. Ways and means of bringing peace between the two factions were discussed.

The November meeting was the third annual joint conference with the U. S. Office of Education. As in previous years special emphasis was given to the critical shortage of scientists and engineers for industry and defense. One reason for this shortage is believed to be the lack of early identification of persons with ability and interest in science. The principal consideration of the joint sessions was to discuss, first, by what kinds of organization of schools, curricula, extraschool programs, and the like science potential might be discovered, and, second, through what techniques and activities the organization might achieve the objective.

It is hoped and expected that a detailed official report of the findings of this conference will be made widely available and that much increase in the effectiveness of science guidance will result. This report should contain complete statistics relative to the shortage and current information as to ways and means of relieving it.

The following items were among those which appeared on the agenda of the separate business meeting of the Committee which followed the joint sessions:

1. Final plans for the Committee's program at St. Louis were discussed and approved.
2. The Committee has not made a great deal of headway relative to the subject-matter versus education rift. It is still hoped that an objective viewpoint may be obtained by both sides toward improving science education at all levels.
3. A definite proposition to be made to the Ford Foundation for support toward a project for the identification of gifted youth was described as nearly ready for presentation under the heading "An Investigation of the Effectiveness of Early Identification and Training of Youth of High Promise, Including Especially Those with High Potential in Science and Mathematics." The Commitee would like to serve in an advisory capacity on the project if it is approved.
4. The establishment of a National Science Foundation aimed to aid students to pursue studies in science is directly in line with the recommendations made to the Steelman Committee in 1947.

The official minutes of the November meeting will soon be ready for distribution. A further insight into the actions of the Cooperative Committee may be had by reading this detailed report. It may be obtained by writing to P. L. Whitaker, School of Education, Indiana University.

PREVO L. WHITAKER,
Indiana University,
Bloomington, Indiana

The Importance of Comparative Histology in Education

HELMER P. K. AGERSBORG, Ph.D., The Agersborg Biological Laboratory, Centralia, Illinois

Comparative anatomy is an old science, long honored in education. Embryology and histology have also been long regarded essentials to a well-rounded biological education; in recent years, cytology and genetics have demanded much attention, and in some degree have colored the interpretation of the older sciences. Protozoology, ecology, physiology, and experimental zoology have crept in on the educational scene with increasing vigor. Parasitology and entomology have been similarly magnified in importance, and have somewhat decreased the popular concept of the old-line subjects, zoology, comparative anatomy, embryology and histology. More recently microbiology, without giving any particular attention to histology, the foundation-study of all higher life, has taken a big slice of the time available for scientific study. Histo-chemistry is a new phase of biology but, unless it is integrated with comparative histology, it will be of little help educationally except as a stain-testing technique.

While histology is absolutely fundamental to an intelligent understanding of pathology, it is excluded from premedical requirements and, in the medical schools, this fundamental subject is covered too hurriedly to have enough value for pathological study. Evidently, as in the case of the liberal arts professions, those responsible for the medical curricula do not realize the importance of comparative histology as a part of medical education. While comparative anatomy and comparative embryology for a long time have been staunch subjects in zoology departments, histology has always held the back-seat, and has been more or less neglected. It has never been a required subject in general education. Sometimes it has been combined or confused with a short course in microscopic technique, without getting very good results in either. If one happened to study mammalian or human histology, it would be dubbed normal histology; if one happened to study invertebrate tissue, it would be called general histology. But these terminologies are irrelevant and lacking in punch. Neither study has much meaning unless it is made in respect to related structures of different species, whether invertebrates or vertebrates.

For, just as the study of the gross anatomy of man or cat, bird or fish, or of any one species has never and can never become a science, so cannot the study of the tissues of any single isolated species become a science. On the other hand, comparative anatomy. comparative embryology, and comparative physiology have been for a long time strong adjuncts and real branches of the great science of zoology because, in these instances, the student has dealt with comparative structures and functions just as in zoology proper.

Ecology, genetics, and cytology have put life into zoology chiefly because they are comparative studies with applications to known facts. Like comparative anatomy, embryology, and physiology, they have challenged the imagination and posed questions the observer has been unable to ignore! What is the meaning of these identical structures in the gross delineations of the bodies of invertebrates and vertebrates? Embryology, likewise, has posed similar troublesome questions, and has been a faithful adjunct explanatory to comparative anatomy. So far, however, like gross comparative anatomy, embryology has been largely a study of topographical developmental anatomy, or a survey of the development of gross structures. Of course, naturally, this is a fundamental study but, if it were followed by a morphogenetic survey of the developing structures, embryology would become a still greater modern science.

But what about histology? The histology of a single species is, indeed, revealing and enjoyable to behold! It entertains and charms, but it does not pose troublesome questions

about the origin of the species, the philosophy of evolution, and the meaning of the many structures. It represents a lot of facts which, if not interpreted through comparative studies of other species, are dulling to the mind and not inspiring. As such, it is a real "harmless parlor subject," useful only to accumulate credits for graduation. When histology is studied without relationship to structures of other species, more or less related, it is practically worthless and is not a science.

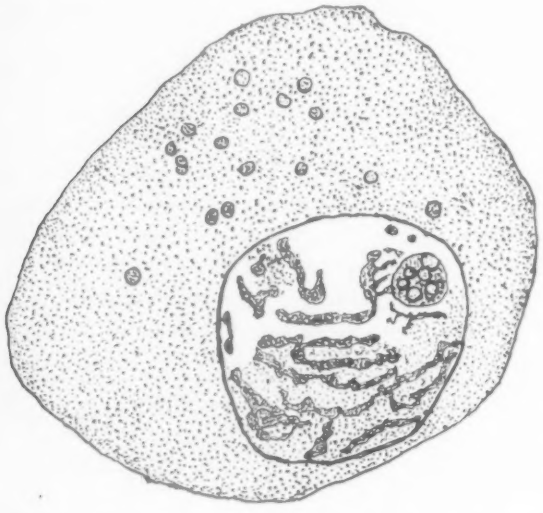
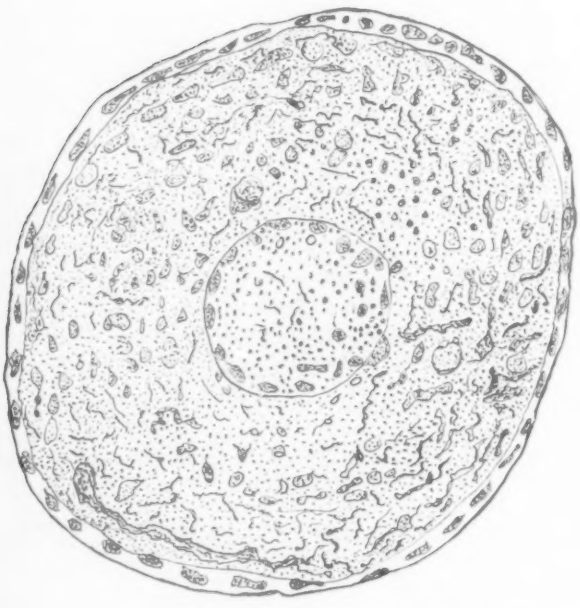


Fig. A. Immature egg of a common invertebrate.

Comparative histology, on the other hand, has deep and profound implications. It gives meaning to things. If studied concurrently with comparative gross anatomy, it would complement it to perfection. It is surely as indispensable for those who intend to study medicine as it is for the professional biologist; when its beauty is more fully appreciated, educators will want it for everybody!

Teachers have sometimes asked me: "When teaching histology, what type of animals should one use?" The answer is: Take a typical, not too highly specialized or degenerated invertebrate, and a typical vertebrate, and make a careful study of the gross anatomy (if that has not already been done by every member of the class). Then study both in all histological details. Then take regional samples from a number of invertebrates, selected phylogenetically; similarly, take regional samples from a number of vertebrates, also selected phylogenetically, and note that the structures of corresponding parts—sensory organs, body-wall, various parts of the alimentary canal, glands, ovaries and testes, blood vessels, sustentatious parts, lungs, lining and surface covering—tend to have a common pattern!



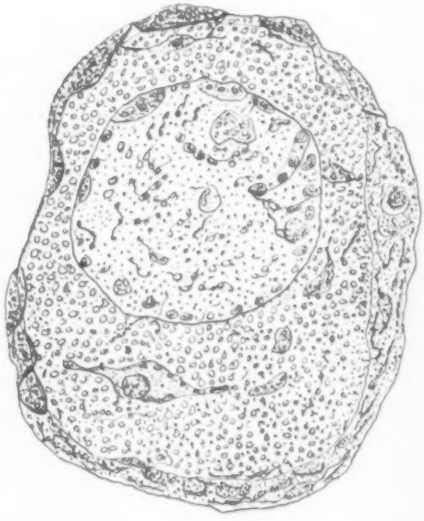


Fig. B. and B-1. Immature eggs of a common vertebrate.

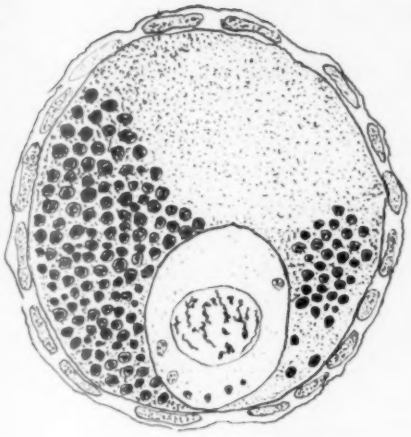


Fig. C. Immature egg of a vertebrate.

Fig. D. Immature eggs of a vertebrate.

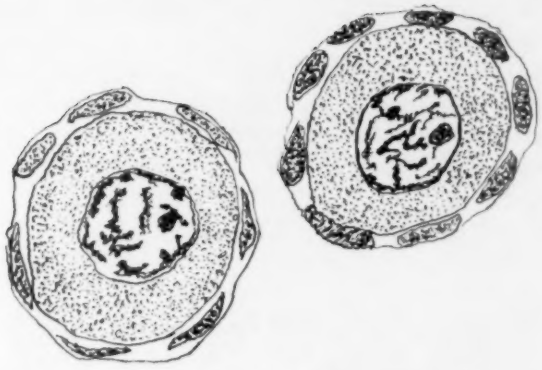


Fig. E. Immature eggs of a common vertebrate.

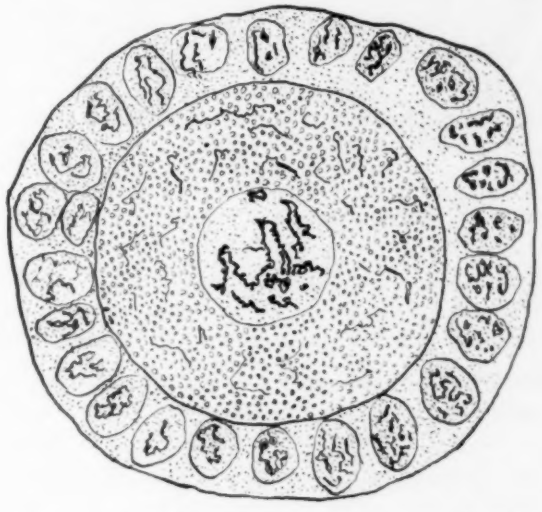
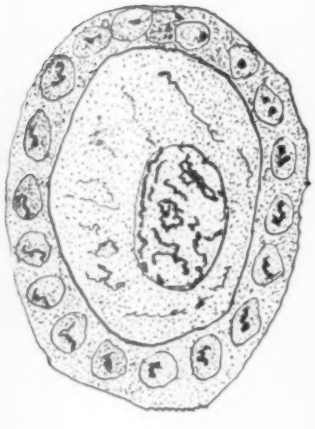


Fig. F. Immature egg of a common vertebrate.



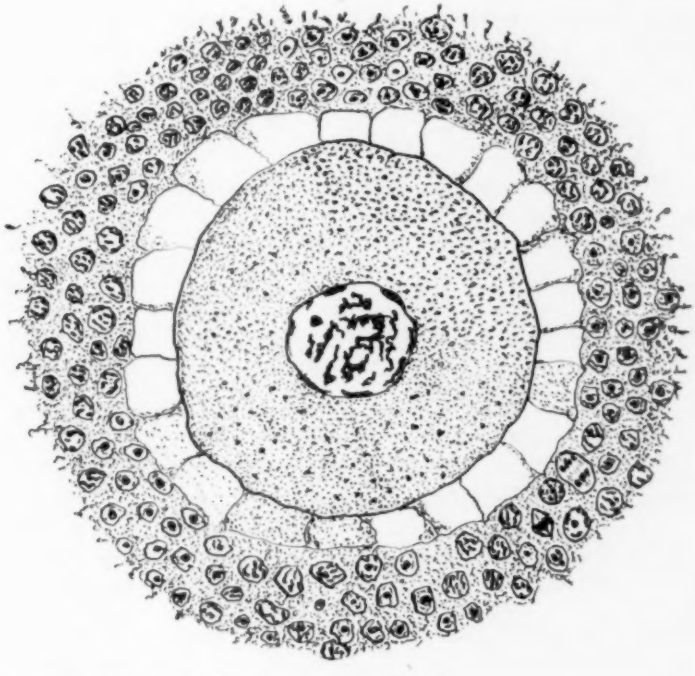


Fig. G. and G-1. Immature eggs of a common vertebrate.

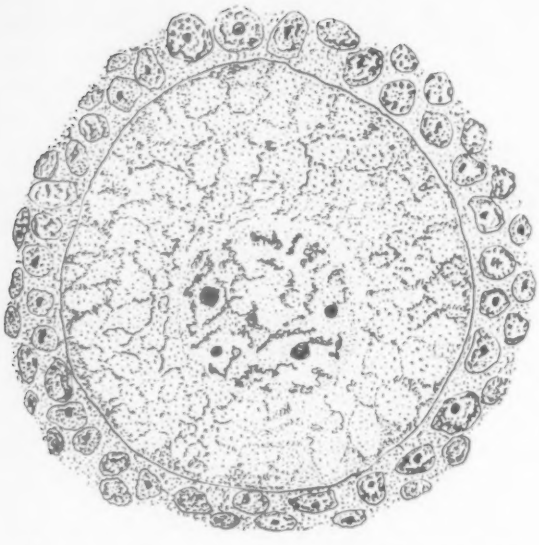


Fig. H. Immature egg of a common vertebrate.

Drawings of Immature Eggs of Eight Well-known Animals, Including Man and One Invertebrate

The smaller cells surrounding the egg are nurse cells. These drawings have been accurately made from slides prepared in The Agersborg Biological Laboratory, Centralia, Illinois. Any high school student or college freshman, who correctly identifies all of the eggs, by giving the generic or common name of the animal to which each belongs, will receive free of charge the slides from which the drawings were made, and $10.00 in cash. The first correct entry received will be judged the winner. Send entries to: Dr. H. P. K. Agersborg, Director, The Agersborg Biological Laboratory, Centralia, Illinois. An Answer Key will appear in the next issue of *The American Biology Teacher*.

The Ecology in Conservation*

HOWARD H. MICHAUD, Associate Professor of Conservation, Department of Forestry, Purdue University, Lafayette, Indiana

The Relation of Ecology to Conservation

The science of ecology is frequently clouded in terms that are too difficult for general reading. This is unfortunate because of the significance of ecology to the conservation of natural resources. *Ecology* deals with the mutual relations between living things and the environment. A knowledge of biotic relationships is fundamental to conservation practices and principles.

Ecology really represents a way of thinking about resources. It takes into consideration all of the factors of environment that in any way affect resources either favorably or adversely. Even though the relationships may be rather complex, there are elementary principles that can be understood by anyone who develops an interest in conservation.

* Presented at the annual meeting of the Central Association of Science and Mathematics Teachers, Chicago, Illinois, November 28, 1952, as a part of the workshop in conservation co-sponsored by the Central Association and NABT.

Geologic Development of Resources

Our most valuable resources are the heritage of time and unyielding change. Man in his limited understanding is prone to assume that "what I see has always been." But the story of the earth is one of great and continuous change. Life forms of ancient seas disappeared, leaving an interesting contribution to the sedimentary limestone rocks as shown by the familiar fossil remains of brachiopod, crinoid and trilobite.

Great physical changes on the earth occurred where land masses sank beneath the sea or new rock strata were raised as warped and folded mountain ranges. It was on the changing shores of balmy inland seas where most of the giant fern group left their record of the important coal and oil deposits of our nation.

The plants and animals of the land and sea were seriously affected by the physical and climatic changes of the earth. Some became extinct, while others may have survived through migration. Pre-historic reptiles, many

insects, the giant mastodon and mammoth became extinct.

More recently, in geologic time, and perhaps of greater significance to us in this region is the influence of glaciation. While science argues the cause, the fact remains that the earth cooled from the day of the semi-tropical ferns that grew into arctic regions to leave a record of coal deposits. Each year the snow's accumulation added to what gradually developed into a great ice cap. Thus began the great ice age and the associated climatic changes that spread along the frigid tongues of ice southward to the Ohio valley.

Potzger [1] relates that "the fossil remains of the mammoth in Florida, the pollens of such northern tree genera as spruce and fir in the peats of Texas, Louisiana and Florida, and in the lowest levels of Indiana bogs, the presence of no other pollens except those of spruce and fir, give mute evidence of immense modifications which the great ice caps made in the life far beyond their own peripheries."

Gradually the rigorous climate moderated, the ice caps melted and great torrents of water cut wide river valleys and left a heritage of thousands of lakes in Wisconsin, Minnesota, Michigan, and northern Indiana. Vegetation also changed with the moderating climate. Spruce-fir forests retreated northward, pines intermingled with the hardwoods and gradually gave way to the extensive forests of oak, beech and maple of the central states.

Wherever vegetation differs today, the ecologist looks to the cause. The great biotic communities have developed as a result of a variety of factors. Climate is generally considered one of the most important factors related to the distribution of living things. Ecologists frequently refer to vegetation as the expression of climate. Other causes of distribution include physiography, soil, the interactions of plants and animals, inherent genetic changes and ability of adjustment.

In order to gain a more thorough understanding of a resource it is necessary to take into account the complexity of factors that have brought about its development in time and place. Soil genesis, for example, is dependent upon the influence of climate, vegetation, composition of underlying rock, topography and time. The gray-brown-earths of the central deciduous forests developed in a climate that was on the average warmer and wetter than that of the light gray podzolic soils of Canada. The natural cover was mainly deciduous forest with an undergrowth of shrubs, herbaceous plants and grasses. This formation produced large quantities of organic matter which was returned to the soil each year in a heavy leaf fall. This soil and its associated temperate climate makes it one of the top ranking regions for agriculture in the nation.

The slow processes of nature make us humble indeed as we attempt to assign utility to resources. When the idea of wise use and management of resources was introduced it was natural to think only in terms of those that were useful to man. Yet who can say today that some ignored phase of the landscape will have no value in time to come. Up to 1910 the chief use of petroleum was production of kerosene for light. Who could foresee the demand for internal combustion engines in tractors, automobiles and diesel locomotives? Of what value is a mosquito, or what good was a bumble-bee until we learned its lesson of pollination?

Interdependence

Leopold [2] referred to ecology as "the new fusion point for all the natural sciences." It relies heavily upon all of the basic sciences in an attempt to interpret the complex interrelations of the biological community. In studying a pond, for example, we may draw a map of it, photograph it, analyze its chemical content, figure its volume, record its varying depth temperatures, and estimate its plant and animal populations by sampling. The tools of various sciences have been employed to collect data and make careful observations. Finally, the results are integrated for a better

[1] Potzger: Bogs of the Quetico-Superior Country Tell Its Forest History. The President's Quetico-Superior Committee, 919 North Michigan Ave., Chicago 11, Illinois.

[2] Leopold, Aldo: A Biotic View of the Land. Journal of Forestry, No. 37, 1939, pp. 727–730.

understanding of the pond as an interdependent association of land, water and life.

The concept of interrelations is particularly relevant in the observation of biological equilibriums. For want of a better term, we speak of "balance in nature" with reference to land and life. This may convey to the layman the meaning that all segments of the landscape are in perfect harmony but the ecologist knows that a complete state of equilibrium never is attained.

A better mental image commonly used in ecology is the biotic pyramid. Soil is the broad base of the pyramid. A great variety of plants grow upon the soil to form the next higher layer. A multitude of insects live upon the plants. The next layer of the pyramid includes the animals such as the fishes, salamanders, toads, frogs, snakes, birds and mammals that feed upon the insects. There are the animals like the deer, elk and bison that eat plants only and others that eat both plants and animals. At the top of the complex are the carnivorous animals, the flesh eaters, called predators.

Each layer is dependent upon those below. The organisms that are eaten must be more abundant than the feeders. The line of dependency from top to bottom of the pyramid is called a food chain. Man is as dependent upon these food chains as any other organism.

The energy from the sun is absorbed by the plant. It flows as a circuit of life through the organisms in the pyramid. All life succeeds if cooperation and competition function properly. When changes occur in one part of the circuit, other parts must make adjustments to it. Normally, changes are slow and not especially disruptive. But modern man has been able to cause changes of unprecedented violence.

Civilized man and his inventions reduced much of the landscape to the soil line. Forests were cut and the soil was planted to farm crops. Domestic animals replaced the deer, elk and bison. Many new plants and animals were brought in. Some proved very useful, others went out of bounds as pests and diseases.

Experience has proven that the introduction of exotic species is generally hazardous. Accidental introductions like the European corn borer, the gypsy moth and Japanese beetle have been most unfortunate. Many intentional introductions like the starling in the United States and the rabbit in Australia have been undesirable. It is perhaps more luck than sense that a few introductions have met with some success as is true of the pheasant and European partridge in parts of the nation. Introductions of any kind should be made only after the most exhaustive research especially with regard to the ecological considerations.

Thus, the pyramid of life has been irrevocably altered in the central deciduous forest, the tall grass prairie to the west, the northern spruce-pine forest, and in the pine association of the south. All land reacts according to natural law. Without the intervention of man the energy circuit strains toward a set of relationships that will put the living community into harmony again with the forces of the environment. The ecologist refers to this progression of environmental changes as succession.

Man's efforts to live with these conditions in nature necessitate cutting weeds, using the plow and arresting succession whenever it serves his interests best. Cornfields must be plowed lest they succeed through weeds, briars and brambles to revert to forest land. But arresting succession embraces other decimating influences depending upon what resources we wish to sustain. Wildlife that is too closely tied to specific habitat disappears. Forests, in one form or another, are a necessity for ruffed grouse. On the other hand, changes effected through agricultural use of the land have benefitted some forms of wildlife. The quail and cottontails have increased because of their successful adjustment to agriculture. The prairie horned lark, meadowlark and other birds have increased their range on expanded open lands of farms.

Resource Management as Related to Ecology

Most problems concerning the management of renewable resources are related directly to an understanding of ecological principles. For

example, land is not all alike. Soils differ because of the rocks, climate, vegetation and topography that have contributed to their development over a long period of time. Even on one farm there may be steep hills, rolling slopes and level bottom land. Every acre has to be planned and treated according to its needs. We have to learn to grow the crops that will give the most protection to the soil. Treating land according to its best use is a fundamental concept in soil conservation.

When our western grassland range becomes seriously overgrazed its vegetation is reduced to annual weeds. Elimination of grazing will permit natural succession through perennial weeds, mixed grass-weed stage, and eventually back to wheat-grass climax. No amount of money spent on weed control can successfully eliminate weeds on the range when it reaches the low ebb of deterioration. The only way is through controlled grazing.

An important phase of forest management is the control of fire and grazing. Fire may destroy forests completely as in the coniferous forests of the Rockies. On the other hand, in the southern pines, controlled burning eliminates the hardwoods and maintains the forest in a sub-climax state. Without fire a predominantly deciduous forest would succeed the pines. The blueberries of the northern Appalachians are maintained by fire where hardwood or mixed forests would otherwise occur.

Uncontrolled grazing on forest lands may have serious consequences on maintaining a sustained yield of timber production. Heavy grazing not only destroys tree seedlings but the composition of shrubs and herbaceous plants is materially changed. In smaller areas like the farm woodlot, it is generally agreed that timber production and livestock cannot be supported at the same time. Big game and cattle must be carefully controlled in large forest areas to support such animals and remain permanently productive of timber.

The problem of wildlife management depends largely upon providing suitable habitat. Every animal species has its own peculiar set of environmental requirements. When these are incompatible with human occupancy of the land the wildlife is sacrificed. Some animals, as well as plants, benefit from man's use of the land. The wildlife manager through manipulation of controls attempts to maintain a balance between the ecological factors that benefit and those that decimate wildlife.

If man's influence upon the land were less violent the problems of management would be much simpler. For, it is in the environment that has suffered least change that there is greater possibility for readjustment in the pyramid of life. This has given rise to the preservation of certain natural areas so that wildlife species like the bison and bighorn sheep may be perpetuated.

In our effort to assign economic value to living resources we continue to disarrange nature's complex rather than work in harmony with natural processes. The indiscriminate use of DDT for mosquito control is a good example. Mills [3] speaks of the devastating influence of DDT in the rookeries of the National Audubon Society in Tampa Bay, Florida. During the summers of 1950 and 1951 these areas received sixteen sprayings for the purpose of mosquito control. The cumulative effects destroyed myriads of frogs, toads, dragonflies, fiddler crabs, fish, lizards and snakes. Needless to say the ecological equilibrium was seriously disturbed.

When the landscape no longer provides the materials to which we assign economic value it is human to attach blame to something. It is then that the lay mind uncovers a great amount of unnatural history. The loss of game is attributed to too many foxes instead of too many tractors. Erosion results from too much rain rather than from lack of vegetative cover. Our judgment is warped by a lack of perspective and inability to look within ourselves for cause.

Human Ecology

Ecological principles must be understood and also applied if conservation is to be effective. Many conservationists believe that the management of resources depends first upon the management of man if the job is to be

[3] Mills, Herbert R: Death in the Florida Marshes. Audubon Magazine, September–October, 1952, Vol. 54, No. 5, pp. 285–291.

done. In the introduction to the proceedings [4] of the 1949 meeting of the International Technical Conference on the Protection of Nature held at Lake Success, the Secretary-General states that "ecology filled six animated and fruitful sessions out of which grew the most important resolution of the conference, that of promoting the study of human ecology."

Conservation in its fullest sense cannot overlook the significance of human ecology. The two pertinent aspects are (1) how man is affected by the environment, and (2) man's influence on the environment. In the first instance, man is a part of the biological complex subject to the vicissitudes of climate, and other elements of his environment. His mode of living is adjusted to his geographical location and therefore conditioned, at least in part, by the ecology of the region.

Man's impact on the environment has been pointed out. His attitude toward land is reflected in depleted soils, cut over forests, polluted waters, and diminished wildlife. Unfortunately, when material resources are reduced, man may become the prize delinquent in an impoverished landscape. The standards of health, sociology, economics and psychology become lowered. In the history of a young nation like America, when resources became exhausted, people moved on to new land and new opportunities. That era of new fields to exploit is past.

Ecology emphasizes man's relation to and obligation toward natural resources. It stresses the need for an enlightened attitude and the necessity of well organized planning in the use of resources. It may be an individual farm with each acre carefully planned, or it may be a huge valley authority like the Missouri Valley Authority, affecting great watersheds, where technical experts formulate a well coordinated and integrated plan for altering the landscape. In either case, the task is accomplished and supervised by a combination of specialists.

The importance of scientific research in promoting sound conservation practices cannot be over-emphasized. It is our most important contribution to the perpetuation of all resources and in the broad ecological concept to the preservation of the human race. But research is of no avail unless it can be applied and for that it must be understood. It is obvious therefore that education in conservation is an important phase of human ecology.

[4] UNESCO: Proceedings and Papers, International Technical Conference on the Protection of Nature. Lake Success, New York, 1949. pp. ix.

Remind yourselves also that copies of current issues of this Journal may be obtained at the reduced rate of 15¢ per copy in quantities for use by student and in-service teachers, or for use in science teaching methods classes.

A Comparative Study of Objectives, Content, and Methodology of Introductory College Courses in Zoology

LOUIS LUTZ, Biology Department, Lincoln Memorial University, Harrogate, Tennessee

Many colleges and universities have been pioneering in planning introductory programs of training in zoology, botany, and biology. Since the University of Chicago Conference on the Training of Biologists, in 1942, The Botanical and Zoological Societies of the American Institute of Biological Sciences have had sections devoted to the teaching of these two subjects.

The following investigation is concerned with surveying and analyzing existing practices in general zoology in colleges and universities. The questionnaire method seemed to be the logical one for gathering desired information because of time and geography factors. Questionnaires were mailed to those Heads of Zoology Departments having membership in recognized state, regional, and national educational associations. 1,635 schools

were listed in the groups above; they were divided into Colleges and Universities, Teachers Colleges, Junior Colleges, and Negro Institutions. After the various schools were tabulated, they were further grouped into their regional accrediting associations (hereinafter designated as RAA). These associations are: the Middle States Association of Colleges and Secondary Schools; the New England Association of Colleges and Secondary Schools; the North Central Association of Colleges and Secondary Schools; the Northwest Association of Secondary and Higher Schools; and the Southern Association of Colleges and Universities.

Replies were received from schools representing 48 states and the District of Columbia. Foreign countries represented were Canada, Hawaii, Puerto Rico, and the Canal Zone. A total of 509 institutions replied to the 1,000 questionnaires sent to the various schools.

The number of questionnaires sent, returned, and actually used:

Colleges and Universities: 594 sent, 305 returned, 219 used.
Teachers' Colleges: 122 sent, 53 returned, 38 used.
Negro Institutions: 56 sent, 14 returned, 12 used.
Junior Colleges: 221 sent, 67 returned, 47 used.
Professional and Technical Schools: 7 sent, 3 returned, none used.
Middle States Association: 162 sent, 63 returned, 42 used.
New England Association: 61 sent, 31 returned, and 20 used.
North Central Association: 361 sent, 167 returned, and 121 used.
Northwest Association: 115 sent, 35 returned, and 22 used.
Southern Association: 291 sent, 98 returned, and 60 used.

An analysis of 312 questionnaires shows the various courses which the respondents offered at their respective schools. An analysis was made of the relation of classroom time to the number of credit hours given; also the number of lecture hours, and the number and length of laboratory periods. Many variations were found in introductory zoology courses in number of semester or quarter hours credit given, and in the number of classroom hours required in relation to credit hours.

Course Content

Animal Structure and Physiological Processes, respectively, are the two most important topics of course content used at the present time. Third place is divided between Classification and Reproduction, with the majority rating Classification third. Also, there is little disagreement as to which topic is the least important. All school types, and all regions except the Northwest, give this place to Heredity.

If circumstances permitted, the majority prefer Physiological Processes as the most important and Animal Structure as the second most important topic of course content, with wide disagreement regarding the third. This place is shared by three topics—Growth and Development, Evolution or Phylogenetic Relations of Animals, and Economic Importance. The majority of schools, classified according to either types or regions, would place Heredity as the least important topic of course content if circumstances permitted.

Testing Devices

At present there seems to be wide diversification in the use of tests. The most frequently used test among the school types and regions is the Multiple-choice, followed by Essay and Completion, and then True-False. There is no disagreement among the group as a whole, types of schools, and RAA as to which is the least used form of test in the monthly bracket. The Oral Test occupies this position.

Instructional Methods

Blackboard diagrams, assignments in the textbook, and demonstration material, respectively, are the three instructional aids that are used most frequently on a daily basis by the various types of schools. The three instructional devices that are most frequently used on a weekly basis are microscopic study and laboratory dissection, demonstration material, and assignments in the textbook, respectively. Movie films, lantern slides, field trips, and projecting microscopes are the devices that are most frequently used on a monthly basis. Lantern slides and field trips rank equally as the second most frequently used device. The majority of school types and accrediting regions list field trips, term papers,

and individual projects as the three instructional devices that are used most frequently once a semester; they list term papers, short papers, and textbook recitation, in that order, as the three instructional devices that are not used.

The instructional methods that would be used most frequently on a daily basis, if circumstances permitted, are blackboard diagrams, assignments in textbooks, demonstration material, microscopic study, and laboratory dissection. The three instructional devices that would be used most frequently on a weekly basis, if circumstances permitted, are microscopic study and laboratory dissection, projecting microscopes, and movie films, respectively. Short papers, movie films, and field trips are the instructional devices that would be used most frequently on a monthly basis, if circumstances permitted. The majority of the schools list term papers, individual projects and field trips as the devices that would be used most frequently once a semester. They list term papers, textbook recitations, and short papers, in that order, as the instructional devices that would not be used if circumstances permitted.

The Group as a Whole (all schools in the RAA), and the types of schools except two, listed C—combined formal lecture and student discussion—as the most frequently used method of classroom teaching; they listed A—formal lecture—as the second most frequently used method of classroom teaching. The Negro Institutions agree with the other schools in the use of method C but, for the second most frequently used method, they list (in order of choice): B—student participation in class discussion; and B/C—student participation in class discussion and combined formal lecture and student discussion. The Teachers' Colleges also agree with the other schools in the use of Method C as the most frequently used method of classroom teaching, but for the second most frequently used method they list B/C.

The Group as a Whole, The Teachers' Colleges, and the schools in the New England, North Central, and Northwest Associations state that they prefer Method C as the second most frequently used type of classroom teaching. The Negro Institutions, Colleges and Universities, and schools of the Middle States Association, if circumstances permitted, would use Method B second most frequently. The Junior Colleges and Secondary Schools prefer using C; they list A as the classroom method that they would use second most frequently.

The schools in the Group as a Whole were nearly evenly divided in opinion as to the question of whether lecture sections should be combined. 49% answered "Yes," and 51% answered "No." The majority of schools and RAA as a whole followed this example. However, most of the Negro Institutions and the schools in the New England Association stated that they did combine lecture sections. There is no overwhelming majority in favor of either method, and they are fairly evenly divided in opinion.

The schools in the Group as a Whole prefer not to have lecture sections combined. 75% answered "No" to the preference. All the schools and three of RAA followed this example. The schools in the New England and Southern Associations were exactly divided in opinion, with 51% answering "Yes," and 50% answering "No." 95% of the schools in the Group as a Whole do not have laboratory sections, and 99% prefer not to have them combined.

According to the way that the questionnaires were answered, it is the author's belief that the majority of the respondents did not know what is a combined classroom and laboratory set-up. Only six schools definitely stated that they used this teaching method. Only one school stated definitely that they would have a combined classroom and laboratory if circumstances permitted. It is felt that there are possibilities for future studies here.

One of the most important issues in general zoology today is the question of the value of drawings. The responses to this section of the questionnaire again reveal a sharp division of opinion. The majority of the schools in the Group as a Whole use C—students make detailed drawings and follow outline drawings. However, closely following was A—students make detailed drawings. 45% answered "Yes" to C and 52% answered "Yes" to A. There was very little consideration of B—students

follow outline drawings; and D—students make no drawings. The majority of the types of schools and the RAA schools agree with the Group as a Whole.

Since the majority of the schools seem fairly evenly divided on the issue of drawings and, since the respondents asked so many questions pertaining to drawings, it is felt that there are possibilities for future studies here.

Course Objectives

There seems to be much agreement at the present time on the matter of objectives. The most heavily emphasized objective in the group as a whole is C—stress principles, and the second and third, B—critical thinking, and A—interesting factual information, respectively. There is no disagreement on objectives in the Group as a Whole; the Colleges and Universities; and the schools in the Middle States, North Central, and Northwest Associations. There does not seem to be as much agreement in preference concerning objectives as there is in present practice. The majority of the schools and RAA members would emphasize B as the most important objective, with C and D following in order.

Opinions

There is more agreement among the schools and in RAA on Section D—opinions—than in any other section of the questionnaire. The results showed that all of the types of schools and all of the regions except one believed that a course in general zoology presented for zoology majors could serve equally well the needs of non-zoology majors. The exception, the Northwest Association, had an equal division of opinion. However, only in the Teachers' Colleges, the Colleges and Universities, and the schools in the North Central and Southern Associations were the "Yes" answers over 50%.

The instructors in the Junior Colleges, the Colleges and Universities, and the schools in the Middle States and North Central Associations believe that the course taught at their particular institutions serves equally well for zoology and non-zoology majors. However, the instructors in the Negro Institutions and the schools in the New England and Northwest Associations were equally divided in opinion on this issue. The instructors in the Southern Association do not believe that the courses taught at their particular institutions serve equally well for both.

The instructors in all of the types of schools except one, and in all RAA schools believe that, if students are taught the fundamental facts and principles of zoology adequately, it can be assumed that they will utilize these in applying them to problems of everyday life. The instructors in the Teachers' Colleges—the exception—answered "No" to this issue. The instructors in all of the types of schools and in RAA did not believe that the general course should consist of material which is only of zoological nature and which is significant only to a zoologist; they did not believe that content from the areas of morphology and taxonomy are more fundamental and significant for beginning students than content from the areas of physiology, ecology and genetics. They believe that a course should be so organized that concepts developed as the course proceeds are used repeatedly throughout the course in the solving of increasingly complex problems, or in attaining increasingly broader concepts. The instructors in all of the types of schools and in RAA, except one, believe that the major emphasis in the general course should be upon the acquisition of fundamental information about animals rather than the development of critical thinking (evaluation of evidence and valid inference). The instructors in the Northwest Association had an equal division of opinion on this issue. The instructors in all of the types of schools and in all schools in the RAA believe that laboratory and field work should form the real heart of the course, in contrast to the presentation of facts and principles through lecture and assigned readings.

The majority of the department heads who answered the questionnaires were not satisfied with their courses. It is felt that this is a problem worthy of further study. If dissatisfactions are due to poor results, this presents a problem worthy of consideration. The majority of the respondents had more than ten years experience in teaching zoology. This

point seems to increase the validity of the study because the respondents have had time and experience to form definite opinions. All except 13 of the respondents were interested in receiving the results of the survey.

A survey was made to ascertain any difference in the course content and in objectives between those respondents having had at least enough course credit in the field of education for a minor, and those having had no education courses. This survey was made of the respondents in the colleges and universities because they represented the largest group of schools, and also because the policies of this type of schools would be less likely to be influenced by philosophy of education. The results of the suvey show that there is no significant difference, in regard to what should constitute the course content and the objectives in an introductory zoology course, between those having a minor in the field of education and those having had no courses in the field of education at all. Does this mean that the study of education has had no impact on the biology teacher? Another survey was made to ascertain if there were any significant differences in the matter of Course Content and in the use of Instructional Devices between those teachers having more than ten years of experience in the teaching of zoology and those having from one to six years of experience. Again the Colleges and Universities were used since they constituted the largest individual group. The results show no significant differences between the two groups of instructors.

Perhaps the most important statement that can be made is that this summary is not to be considered as or used as an infallible guide. The object was to get a picture of what is being done at the present time by zoology teachers over the nation and in some near-by countries, and what they would like to do if time and circumstances permitted. At most, differences in rating various parts of the questionnaire should serve as a challenge to all zoologists.

Perhaps the tabulated results would be changed somewhat—but without greatly altering the picture—if all the data could be grouped and discussed to the point of unquestionable clarity. The peculiar irregularity of a specific objective being rated high and a necessary subsidiary objective being rated low would undoubtedly disappear in some of the cases.

Since any worth-while problem lends itself, on the basis of its results, to additional studies, the following questions and statements are included with the hope they may be of some value:

1. On the issue of drawing—which are best, detailed drawings, or detailed and outline drawings combined? The study shows that at the present time the schools are fairly evenly divided on this issue. It would probably be of value to set up controlled groups and test the two methods under actual laboratory situations.
2. The value of a general biology course versus general zoology—which is better for an introductory science course?
3. Can the same science course be used by science and non-science majors? According to the additional remarks received, many instructors seemed to be interested in this matter. All the schools said "Yes."
4. Although complete uniformity is probably not desirable, should a more or less standardized system be followed concerning distribution of time—the number of lectures, and the number and length of the laboratory periods?
5. Although complete uniformity is probably not desirable, it would be interesting to know why a good many of the Chairmen of departments are dissatisfied with the general zoology courses in their respective institutions.
6. Apparently little attention has been given to the possibilities of the combined lecture and laboratory type of course. The possibilities of this type of course under controlled laboratory conditions seem to be worthy of further study.
7. Do courses in education make a better zoology teacher? If so, just which education courses would be of genuine value?

Some Educational Activities of the National Wildlife Federation*

WALTER P. TAYLOR, United States Fish and Wildlife Service, retired

The National Wildlife Federation was organized at the first annual North American Wildlife Conference called by President Franklin D. Roosevelt and convened in the Mayflower Hotel, Washington, D. C., in February 1936. A tentative constitution was drawn up, J. N. (Ding) Darling was selected as Acting President, Frederick C. Walcott, I. T. Quinn and W. L. Finley were made Vice Presidents, and the name "General Wildlife Federation" decided on. The following year the constitution was ratified and the name changed to National Wildlife Federation. As pointed out by Bud Jackson in a recent sketch of the Federation's history, the organization remains today what it started out to be, an organization of national scope, of federations on the state level composed of local or county units embracing groups who believe in wildlife conservation. Note, however, that the National Wildlife Federation is strictly an organization of organizations, not of individuals.

According to the By-Laws of the National Wildlife Federation the purpose of the organization is:

"To organize all conservation agencies for the purpose of securing adequate public recognition of the needs and values of wildlife resources; to develop a comprehensive program for the conservation of wildlife; to broadly publicize discoveries and needs in the wildlife field; and to cooperate with other conservation organizations."

It will be immediately recognized that all these objectives are educational in character. It is therefore highly appropriate that the By-Laws call for a Standing Committee on Education.

Conservationists are coming to an appreciation of the fact that it is vital for Americans to incorporate conservation principles into their individual and national habits of thought and action. Nothing less will suffice in the present world emergency. Demands of industry upon natural resources in minerals, soils, waters, range resources, forests, wildlife and others increase with the passage of time and the burgeoning of population. Hot and cold wars and preparations for wars mean large drafts on productive units and tend to further deplete those resources in short supply. It becomes obvious that the least a thoughtful citizen can do is to try to secure better conservation of all natural resources as a basis for future security.

Perhaps the most promising of all human enterprises is the training of a new citizen generation which will harbor deep in its consciousness a strong desire to do everything necessary toward maintaining the material basis for future good living. And, of course, grownups, as well as children, must be well informed and enthused so as to assure all possible conservation efforts as quickly as practicable.

It was early stated that "The Federation has formally adopted Conservation Education as its primary objective . . . ." (Inside back cover, "The Foundations of Conservation Education," 1951).

It will be recalled that the Federation has published a number of bulletins and books, notably three reports on education in conservation,[1] all under the editorship of the late

*Address delivered (in part) June 18, 1952, at the joint meeting of the National Association of Biology Teachers and the American Nature Study Society, Western Division, Oregon State College, Corvallis, Oregon, in connection with the Thirty-third Annual Meeting, Pacific Division, American Association for the Advancement of Science.

[1] "Conference on Education in Conservation," held at the Annual Meeting of the National Wildlife Federation, February 16, 1939, Detroit, Michigan (Pamphlet No. 1); "Education in Conservation," Committee on Education, Pamphlet No. 2, held at the Fifth North American Wildlife Conference, March 18, 1940, Washington, D. C.; "The Foundations of Conservation Education," Education in Conservation, Pamphlet No. 3, 1941.

Henry Baldwin Ward, distinguished former chairman of the Committee on Conservation Education. The "Save America Series," fifteen leaflets in which attention was given to vital conservation problems, also was published in a large edition. Four selected illustrated booklets, under the title of the "My Land and Your Land Conservation Series" for grades 3 to 8 have been extremely popular, and have been several times reprinted. A request has recently (1952) been received from our neighbor on the north for a Canadian edition of this series of four pamphlets. Thousands of service leaflets dealing with timely conservation topics have been distributed by the Federation. In 1951, approximately 8,000 sets of free material consisting of 121,500 individual pieces were sent out. Up to March, 1952, more than 4,000 requests involving nearly 50,000 individual pieces were mailed.

Many persons are familiar with the animated black and white cartoon "Once Upon A Time," by "Ding" Darling, which tells in unforgettable fashion the story of how the white man has dealt with the land, the plants and the animals, also with Mr. Darling's "Poverty or Conservation," a classic and convincing presentation of the conservation theme. Another outstanding bulletin is Alexander Martin's "Botany and Our Social Economy." Most recent booklet is "Conservation Education for American Youth," published by Ohio State University, based on a conference sponsored by Ohio State University and other Ohio educational groups and the National Wildlife Federation.

Another ambitious publication for which the Education Committee is responsible is "Man on the Landscape," by Vernon Gill Carter, Supervisor of Conservation Education, Zanesville, Ohio, public schools and former executive secretary of the Committee on Education. This volume, which stresses the fundamentals of plant conservation, emphasizes in a striking manner some of the conservation jobs which will have to be done if we are to survive prosperously.

Also in behalf of the Committee, Carter compiled lists, first, of conservation books, booklets, and teaching aids for the use of teachers and students in teachers colleges and, second, of motion picture films in the conservation field. These mimeographed lists are available on request to the Washington office of the Federation.

Appreciative mention also should be made of the attractive Wildlife Stamps, and other artistic educational illustrative matter, which have characterized the Federation's program from the beginning. Wildlife Week activities sponsored by the Federation have been helpful. State governors often have proclaimed the special week designated, and conservation programs have been given in many service clubs and other local organizations, as well as on numerous radio programs.

Mention should be made also of the most attractive book "Wildlife In Color" by Roger Tory Peterson, based on National Wildlife Federation colored Wildlife Conservation Stamps and published by Houghton-Mifflin. This bright publication bids fair to become a best seller and its beneficial conservation and educational impact is undoubted.

But these things lie in the past. I am sure the Committee's present and future program is of greater interest to us here today even than anything that has gone before.

In a dramatic letter read at the annual banquet held in his honor at Miami, Florida, March 19, 1952, which, unfortunately, he was unable to attend, J. N. (Ding) Darling wrote: "The battle for conservation is not being won, and, like the Army of Liberation in the Korean War, we of the Conservation Army possess the best modern scientific know-how in the world yet the best we are able to achieve is only a costly stalemate against the hordes of knuckleheads who are bent on driving us, and the principles we stand for, into the sea."

The physicists, with their chain reactions, have produced the atomic bomb. Why can't we initiate and get going a mental and moral chain reaction which will acquaint the masses of the people with our urgent national and world conservation program? Seemingly, through the teachers colleges and the schools, as well as numerous other agencies, we have a wonderful opportunity for interesting and informing the public.

Some National Wildlife Federation publication activities are as follows:

A manuscript "Topsoil and Civilization," dealing with the relation of natural resources (principally soils), to world history, is in preparation by Tom Dale, U. S. Soil Conservation Service, and Vernon G. Carter, Conservation Director, Zanesville, Ohio, public schools.

Urban School Leaflets—The marked trend of population from country to city makes desirable the development of conservation leaflets for city children, somewhat similar to Cornell's rural school leaflets. Such a series, suggested by Lloyd F. Wood, is promised by the Conservation Committee.

Approaches to Conservation Education—A successor series is planned to the former Save America Series. Within a year a series of four-page leaflets will be available at low cost, each covering a timely topic of conservation interest.

Official "National Wildlife Calendar" and "Songbirds of America Calendar"—At the Miami meeting of the National Wildlife Federation in March, 1952, it was reported that 100,000 calendars of each of these, for 1953, have been printed already. These are sold through a commercial outlet, but the National Wildlife Federation is supplying the illustrations and educational matter.

Published Books on Birds Available to Sportsmen—A list of books on birds which are available, readable, and dependable, will be ready this year, promises Herman Forster, Chairman of the Sub-Committee on Published Books and Motion Pictures of the Committee on Education. Collaborating in the preparation of this list are John Kieran, Gustav Swanson, Fairfield Osborn, E. Laurence Palmer, Richard H. Pough and others. Lists of books covering mammals, fishes and other forms will be prepared as rapidly as possible.

Grants-in-Aid

Under a decision by its Board of Directors, not more than ten per cent of the operating net income of the National Wildlife Federation can be used for Grants-in-Aid to state affiliates for conservation enterprises *in addition* to their regular going activities. The local affiliate must guarantee 25 per cent of the cost of each accepted project. In 1951 there were 11 Grants-in-Aid; in 1952, 23 out of 30 applied for, with a total outlay of approximately $20,000.00 by the National Wildlife Federation and at least $6,600.00 by its state affiliates. Activities supported in the current year included teachers' workshops, junior conservation camps, conservation workshop, publication of conservation manuscripts, additional circulation of state wildlife magazine, and miscellaneous.

Cooperation with Conservation Organizations

The National Wildlife Federation cooperates with a variety of conservation organizations, among these the National Education Association (American Association of School Administrators and other branches), the National Committee on Policies for Conservation Education, the American Association for the Advancement of Science, the International Union for the Protection of Nature, National Science Teacher's Association, American Institute of Biological Sciences, Outdoor Writers Association of America, National Association for Research in Science Teaching, American Nature Study Society, National Association of Biology Teachers, Entomological Society of America, Yale University, New Haven Teachers College, the Wildlife Management Institute, the North American Wildlife Conference and numerous other conservation activities throughout the country.

International Conservation

Booklet on Conservation Education in the International Field—Ira N. Gabrielson, of the Wildlife Management Institute, has requested the National Wildlife Federation to prepare a bulletin for use in foreign countries. The body of the bulletin will be by E. Laurence Palmer, with illustrations by Clayton Seagears, with a four to eight page jacket suitable to the area where it is to be used, as for example, Chile or India, or elsewhere, with the inside pages telling a universal story of the need for conservation. A similar booklet has been requested by the Pan-American Union.

International Union for the Protection of Nature—The constitution of the National Wildlife Federation proclaims cooperation with other conservation organizations in the western hemisphere and elsewhere as one of its objectives. One of the ways this is being worked out is through the International Union for the Protection of Nature, which has held recent meetings at Fontainebleau, France, Lake Success in the United States and Caracas in Venezuela.

Visual Activities

Exhibits—The National Wildlife Federation, principally through its Field Program and its Committee on Conservation Education, sponsors exhibits at selected scientific meetings, as well as appropriate film strips covering soil conservation, farm ponds, forest fires and wildlife. Plans are under consideration for making improved use of radio and television for conservation education.

Conservation Fellowships

The J. N. Darling Fellowships—Four J. N. Darling conservation fellowships, each of $1,000, are granted annually by the National Wildlife Federation through the Conservation Education Committee. Forty-one applications for these fellowships were received this year. Grants were made to Long Beach State College, California (Conservation education in an urban center); Cornell University (Conservation tape recordings; Who's who in conservation education; Philosophy of conservation education); Boston University (Organization and aims of outdoor conservation education); and the University of Wyoming (Development of instructional units for teaching conservation in secondary schools).

The James Hopkins Scholarship—The income from a gift of $20,000 made to the National Wildlife Federation by James Hopkins, amounting to about $1,000 per year, will be used for a conservation scholarship to some meritorious candidate.

Conclusion

These are some of the educational activities being provided by the National Wildlife Federation. They are supported by the public's purchase of conservation stamps. Moneys received contribute on a non-profit basis, to the conservation cause throughout the United States, and in foreign lands, as practicable opportunities develop.

Books

Moody, Paul Amos. *Introduction to Evolution.* Harper and Brothers, New York. 475 pp. illus. $6.00.

This college level book, designed for students with little or no background in biology or geology, can be understood by the more interested students in high school biology. Technical terms are used only when necessary, and most of them are defined when first used.

After two introductory chapters, the main part of the book is devoted to twelve chapters presenting the facts of evolution, followed by five chapters dealing with theories and implications.

Hyman, Libbie Henrietta. The *Invertebrates: Acanthocephala, Aschelminthes, and Entoprocta—The pseudocoelomate Bilateria.* Vol. III. McGraw-Hill Book Company, Inc., New York. vii + 572 pp. illus. 1951. $9.00.

This volume completes the treatment of the noncoelomate invertebrates. Like its predecessors it consists (using the words of its modest author) of a fusion of a small amount of original knowledge with a large amount of compilation from the literature. Dr. Hyman estimates that the conclusion of her self-appointed task of writing a comprehensive treatise on the invertebrates will require at least three more volumes and need at least fifteen more years. This is somewhat less time than has already gone into the labor. The coelomate invertebrates remain to be considered.

The book is illustrated with hundreds of drawings made by the author. The bibliographies are very extensive, covering a total of 52 pages. The phylum Aschelminthes—quite a diverse group—occupies more than four-fifths of the space. In it are included as classes the Rotifera, Gastrotricha, Kinorhyncha, Priapulida, Nematoda, and Nematomorpha. Although the main emphasis of the book is on morphology, classification, and phylogeny, the physiology and ecology of the groups are interestingly discussed. Based upon her reputation for scholarship it seems safe to predict that Hyman's treatise will be the leading reference in English on the invertebrates for a long time to come.

Edward C. Colin,
Chicago Teachers College,
Chicago, Illinois